

Mixing one's wines may be a mistake,
but old and new wisdom mix admirably.

Bertolt Brecht (1898–1956)

LAWS, REGULATIONS, AND POLICY

Consumer Protection Act Sees Uneven Launch

The Consumer Product Safety Improvement Act (CPSIA), passed by Congress in 2008 in response to widespread recalls of lead-containing toys manufactured in China, imposed new testing and documentation requirements upon manufacturers of juvenile products and gave the Consumer Product Safety Commission (CPSC) new enforcement powers to ensure compliance. Six months after the new law was scheduled to go into effect, however, it is still the subject of controversy and confusion.

The new law set maximum permissible levels of 600 ppm lead (used to inexpensively increase durability, weight, and paint brightness) and 0.1% of three specified phthalates (plastic softeners) for products intended for children aged 12 years and younger. A more stringent lead level was phased in 14 August 2009, when the permissible level dropped to 300 ppm; in two years it will drop again, to 100 ppm. Manufacturers were to ensure their products do not exceed those levels prior to release into the marketplace.

But the testing requirements met strong opposition from manufacturers, who argued that the timeline and content of the rules

2009 *Federal Register* that wood, natural fibers, and gemstones joined selected metals and alloys as materials that are exempt from testing. In addition, the CPSC clarified the conditions that must be present—such as security against leaching—in order for a lead-containing component part to be deemed “inaccessible” during “normal and reasonably foreseeable use and abuse of the product by a child.” Inaccessible component parts contained inside a product, which typically are not touched or mouthed by a child, also are on the list of testing exemptions.

Another requirement, which did go into effect August 14, calls for manufacturers and importers to include tracking labels on all children's products manufactured after that date. Tracking labels must provide information about when and where a product was made, which will help officials locate specific children's products in the event of a safety recall. The rule also originally required that manufacturers include specific information such as batch and lot numbers, but small manufacturers objected to this provision because they lack the production volume to justify the sophisticated batching systems employed by larger manufacturers. In response, the CPSC allowed small manufacturers to comply solely by maintaining adequate records of the components they use.

Despite the confusion surrounding CPSIA, manufacturing interests and children's health advocates alike agree it is an essential

have to comply with some of these provisions that are just unrealistic, that is a serious concern to us.”

Some of those provisions have been addressed by the CPSC, but Dwyer thinks there are others. The biggest area of concern remains the expense and logistics of testing, he says. For instance, handheld X-ray fluorescence (XRF) machines provide an affordable method for determining the presence of lead in products but may not provide sensitive enough measures of lead content to meet CPSC requirements when the stay is lifted next February. In the case of lead testing, Dwyer says, “Our advice to our members is to use XRF testing as a marker. If it's coming up with lead content, make sure you do your due diligence and if necessary perform the necessary wet chemistry testing to verify compliance with the lead-level limits.”

Rachel Weintraub, director of product safety and senior counsel at the Consumer Federation of America, is an advocate for lead-free children's products and a strong CPSIA, but agrees that the stay on testing was a good idea. “There was confusion,” she says. “The CPSC was not as clear as they could have been.” During a 10 September 2009 hearing by the House Subcommittee on Commerce, Trade, and Consumer Protection, newly appointed CPSC chairwoman Inez Tenenbaum pledged to “continue to solicit feedback from all involved parties, and work to implement commonsense rules that are squarely focused on maximizing product safety and reducing administrative burdens.”

Weintraub points out that CPSIA marks a profound change for the CPSC because that agency had never had pre-market jurisdiction before. She contends the CPSC needs time to work out regulatory details of the law. “When the whole regulatory structure of an industry changes, there are going to be growing pains,” she says. “But once we see how it's working, I think it will show that our products have changed for the better.”

In the meantime, public health officials recommend that parents wash their children's hands several times a day in case they have handled lead-containing products. They also suggest parents prevent children from putting painted, metal, or plastic items in their mouths unless the parent is certain the item is safe.

Boston freelance writer **Richard Dahl** has contributed to *EHP* since 1995. He also writes periodically for the Massachusetts Institute of Technology.



Jewelry may consist of a lead core coated with another material such as nickel. It may also be decorated with lead-containing enamel or assembled with lead solder.

imposed an unrealistic burden on small and large producers alike. Days before the requirements were to go into effect, the CPSC issued a one-year stay of enforcement until 10 February 2010 to provide agency staff time to develop guidance on when and how testing is to be done, and on what materials.

Such guidance has begun to emerge. The CPSC announced in the 7 August

law, albeit a work in progress. “We supported the legislation from day one, as long as it didn't put small operators out of business,” says Michael Dwyer, executive director of the Juvenile Products Manufacturers Association. “For bigger companies, it might still be a burden, but they have the resources at their disposal [for testing and tracking]. But when you've got mom-and-pop companies that

CANCER

Childhood Leukemia and Proximity to Nuclear Power Plants



Gundremmingen Nuclear Power Plant
Günzburg, Bavaria

wrote, “Since the determination of distance using the central point of the community was much less exact than using individual residential addresses, as in the case-control study, a correspondingly less clear measure of effect was to be

expected. In this respect the two approaches are not contradictory.” Co-author Claudia Spix, deputy director of the German Childhood Cancer Registry at the University of Mainz, explains, “We wished to demonstrate the basic agreement of the results obtained by both approaches.”

Some researchers conclude that the consistency between the KiKK study findings and comparable ecological studies proves the real controversy is no longer about the validity of the leukemia-distance association. “Rather,” says Nussbaum, “it involves both the mechanism of the disease initiation and the public health implications of the confirmed leukemia clusters near NPPs.”

Others believe this stance is premature, given that the KiKK researchers were unable to adjust for any potential confounders besides sex and age—leaving the possibility that some factor besides radiation caused the children’s disease. Currently, however, ionizing radiation is the only established environmental risk factor for childhood leukemia, according to a review by Martin Belson and colleagues published in the January 2007 issue of *EHP*. At the very least, Nussbaum argued in the July–September 2009 issue of the *International Journal of Occupational and Environmental Health*, the KiKK study points out the need for a critical reexamination of the fundamental assumptions and models underlying current radiation safety standards and regulations.

In a time when many governments are exploring alternatives to fossil fuel-based energy, nuclear power also remains controversial because of unresolved questions about the safe storage of radioactive waste and the potential for radioactive contamination stemming from accidents or terrorist attacks. In any area where science, politics, and powerful commercial interests meet, it is critical to focus on the science, says Mangano. “Studies of childhood cancer and leukemia from exposure to nuclear reactor emissions have been clouded by political factors,” he says. “A challenge to objective, dispassionate science is to overcome this and help policy makers make the right decisions in this emotive area.”

Since the first report of increased childhood leukemia rates around Britain’s Sellafield nuclear power plant (NPP) in 1983, controversy has surrounded the possible link between the disease and proximity to nuclear reactors. Twenty-five years later the debate rages on, with different studies yielding seemingly contradictory findings. A public sensitized to the dangers of nuclear power might well ask the question: why aren’t we sure by now?

“The many studies that have been performed are difficult to compare because of differences in their methodology,” explains John Bithell, honorary visiting fellow at the Childhood Cancer Research Group, University of Oxford. These differences include the age groups studied, the geographical areas considered, and potential confounding factors such as socioeconomic status.

“Moreover,” says Bithell, “we are looking at a very small effect in terms of the actual numbers of sick children involved, and the statistical tools used have not always had the necessary power to allow conclusions to be drawn. Add all this to the fact that we do not actually know [all] the causes of leukemia, and you can see that it becomes difficult to firmly establish a link between it and NPPs.”

According to industry records and the presently accepted canon of radiobiology as defined by national and international radiation regulatory bodies, children living near NPPs are exposed to doses of radiation orders of magnitude below those thought to cause leukemia. However, Rudi Nussbaum, a professor emeritus of physics and environmental sciences at Portland State University, says evidence of extreme radiation sensitivity of embryos and fetuses has been largely ignored in this canon, as have reports

of low-dose health effects from inhaled or ingested radioactive fallout at large distances from the Chernobyl nuclear disaster.

It is challenging—but not impossible—to estimate the effective dose of ionizing radiation from an NPP to which a child may have been exposed over the years, says Joseph Mangano, executive director of the nonprofit Radiation and Public Health Project. Measurements of in-body levels of radioactivity are critical to resolve this issue, he says. Perhaps the most feasible way to take such measurements is to test for bone-seeking isotopes in baby teeth.

The German KiKK (Kinderkrebs in der Umgebung von Kernkraftwerken) study, a case-control study described by Peter Kaatsch and colleagues in the 15 February 2008 issue of the *International Journal of Cancer*, found that children under age 5 years living within 5 km of an NPP were at more than double the normal risk of developing leukemia. Although similar links have been reported by several other authors, a number of ecological studies suggest that children living near NPPs are at no greater risk than other children. The KiKK study pinpointed the distance of individual case homes from each of the 16 German NPPs and was therefore better able to classify exposure than ecological studies, which use approximate distances to classify exposure. Nussbaum argues that ecological studies tend to average out the significant risk-distance association, especially when the number of cases is small.

Alfred Körblein, a retired physicist formerly with the Munich Environmental Institute, a German nongovernmental organization, makes a similar observation regarding a recent re-analysis of the KiKK

data published in volume 105, issue 42 (2008) of *Deutsches Ärzteblatt International*, which used approximate distances to estimate exposures. “This ecological analysis of the same data yielded only a nonsignificant 41% increase [in leukemia incidence] in the 0- to 5-km zone compared to the 119% increase in the superior case-control analysis,” he says. “But that’s what you’d expect when using the weaker ecological approach.”

In fact, in their 2008 ecological analysis Kaatsch and colleagues

Suggested Reading

- Baker PG and Hoel DG. Eur J Cancer Care 2007;16:355–363
- Bithell JF et al. Radiat Prot Dosimetry 2008;132:191–197
- Busby C et al. Med Confl Surviv 2009;25:20–40
- COMARE 10th report. J Radiol Prot 2005;25:335–336
- Evrard AS et al. Br J Cancer 2006;94:1342–1347
- Fairlie I. Med Confl Surviv 2009;25:197–220
- Hoffmann W et al. Environ Health Perspect 2007;115:947–952
- Kaatsch P et al. Int J Cancer 2008;122:721–726
- Kaatsch P et al. Dtsch Arztebl Int 2008;105:725–732
- Laurier D et al. Radiat Prot Dosimetry 2008; 132[2]:182–190
- Mangano J and Sherman JD. Eur J Cancer Care 2008;17:416–418
- Nussbaum RH. Int J Occup Environ Health 2009;15:318–323

WATER TREATMENT

Sweeteners Persist in Waterways

Artificial sweeteners are widespread in European sewage treatment plant effluent, waterways, groundwater, and even drinking water, a growing body of research demonstrates. One of the latest studies, published in the July 2009 issue of *Analytical and Bioanalytical Chemistry*, presents data on four common sweeteners found in German water and demonstrates the persistence of these additives. Two, acesulfame and sucralose, were remarkably resistant to treatment by conventional sewage treatment plants as well as by a more advanced soil aquifer treatment plant, report environmental engineer Marco Scheurer and colleagues from the Water Technology Center in Karlsruhe.

In samples taken from four German rivers, concentrations of acesulfame exceeded 2 µg/L, whereas concentrations of sucralose, cyclamate, and saccharin were an order of magnitude lower. Coauthor Frank T. Lange, an analytical chemist, notes that a person would have to drink 2–3 L of water with sweetener concentrations similar to those of the German rivers every day for years before they would consume the amount contained in a single sweetener tablet (the concentrations detected in water were well below human taste thresholds). Three other sweeteners—aspartame, neotame, and neohesperidin dihydrochalcone—were not detected in any of the samples.

The findings echo those of four recent studies documenting artificial sweeteners in sewage treatment plant effluent and waterways throughout Europe. Preliminary results from two separate studies—one unpublished and one accepted 11 September 2009 for publication in *Marine Chemistry*—also show sucralose in Arizona wastewater treatment plant effluent and several downstream rivers, as well as in coastal and Gulf Stream waters off the southeastern United States.

Acesulfame and sucralose, which is sold in the United States as Splenda®, have proven to be the most commonly found and resilient sugar substitutes. They are added to a wide variety of foods, beverages, pharmaceuticals, and toiletries, and they pass through the human body virtually unchanged. Cyclamate and saccharin are much less persistent.

Cyclamate has been banned in the United States since 1970 as a possible human carcinogen, but the Food and Drug Administration is considering reapproval. And although saccharin has been found to cause cancer in rats, it is considered safe for human consumption.

All the sources interviewed for this article agree there's little risk that acesulfame and sucralose in drinking water will cause human health problems. The implications for the aquatic environment are less clear, however. Because these sweeteners have been classified as safe for human consumption, they have undergone virtually no environmental testing. Yet the remarkable persistence of acesulfame and sucralose gives some experts pause, given that environmental concentrations will likely rise over time with continued consumption.

Henrik Kylin, an environmental chemist at the Norwegian Institute for Air Research and a coauthor of a study on sucralose presented at the Society of Environmental Toxicology and Chemistry Europe 17th Annual Meeting in 2007, points out that sucralose mimics sucrose, a structurally similar molecule involved in biological functions from the regulation of genes related to photosynthesis to feeding cues in zooplankton. "If those [functions] are affected, you may end up with serious ecosystem effects," he says.

Kylin is also concerned by the finding, reported in the October 2006 issue of *Plant, Cell & Environment*, that sucralose at least partially inhibited sucrose transport in sugarcane. "There are very many vascular plants in the aquatic ecosystem," he says, "and if they are [similarly] affected, it would affect very many other organisms."

Rosa Krajmalnik-Brown, an assistant professor of environmental biotechnology at Arizona State University, has been working for more than two years to identify a microorganism that can degrade sucralose and hasn't found one yet—although she says she's not giving up. Still, there may be a bright side to sweeteners' persistence: Scheurer and other researchers have proposed using them as markers for detecting wastewater spills—a welcome finding for scientists who have long sought a failsafe marker.

Rebecca Kessler, based in Providence, Rhode Island, is a senior editor at *Natural History* and writes about science and the environment for various publications. She is a member of the National Association of Science Writers and the Society of Environmental Journalists.

The Beat

by Erin E. Dooley

Vehicles Concentrate Nicotine

A study by Patrick Breyse et al. published online 25 August 2009 ahead of print in *Tobacco Control* found that vehicle passengers riding with smokers may be exposed to nicotine levels 40–50% higher than those found in restaurants and bars that permit smoking. Nicotine

concentrations inside vehicles increased twofold for every cigarette smoked, and while opening the windows reduced smoke somewhat, it did not eliminate exposure within the vehicle. Breyse et al. state the levels are unacceptable for nonsmoking passengers, especially children, who are at increased risk for secondhand smoke-related health problems.

USDA Maps Local Food Production

Until recently, low fuel prices meant the U.S. food system could rely on food imported from other countries, but rising transport costs and regional food shortages and crop failures are among several factors encouraging a closer look at local food production. Wayne Honeycutt and colleagues at the Agricultural Research Service are now mapping data from Maine to Virginia on weather, soil, land use, and water availability to model potential crop production and determine local food production capacity. They say expanding opportunities for local food production could stimulate rural development and offset the risk of food shortages by diversifying and increasing local production in other areas.



School Averts EMF-Related Closure

The debate over the safety of electromagnetic fields (EMFs) nearly closed a New Jersey school this fall until the state's biggest electric utility and the Sussex County Board of Education reached an eleventh-hour settlement. The board had planned to close the K–6 Fredon Township School 1 October 2009 because the existing high-voltage power line crossing the school's playground had been found to

Left to right: Aaron Amay/Shutterstock; Aristide Economopoulos/The Star-Ledger

DIET AND NUTRITION

Next Course in Organic Debate

With the Northern Hemisphere's peaking summer produce crop came a new iteration of the question of whether organic food is worth the extra expense. According to a review commissioned by the U.K. Food Standards Agency and published 29 July 2009 ahead of print in the September 2009 *American Journal of Clinical Nutrition*, organically grown food is no more nutritious than conventionally grown food. But organic proponents question the findings and also note that the health benefits of organic agriculture can go beyond nutrition.

The review authors identified more than 52,000 studies dating back to 1958 that compared organic and conventional foods. Of these, 55 studies were deemed of sufficient quality. None of the studies predate 1990—an important point, says first author Alan D. Dangour, a senior lecturer at the London School of Hygiene & Tropical Medicine, because one chief criticism of the review has been the fact that agriculture has changed markedly over the past 60 years.

Of 11 parameters examined, organic crops had significantly higher phosphorus content and titratable acidity (which is not a nutrient but a food processing metric) whereas conventional crops had higher nitrogen content. Differences in levels of vitamin C, phenolic compounds, magnesium, calcium, potassium, zinc, total soluble solids (mostly sugar), and copper were insignificant.

The results contradict a review published as the report *New Evidence Confirms the Nutritional Superiority of Plant-Based Organic Foods* in March 2008 by The Organic Center, a nonprofit food research outfit. This review found that total phenolics, vitamin E, vitamin C, quercetin, and total antioxidant capacity of organics exceeded that of conventionally grown produce—in the case of total antioxidant capacity, by 80%. Conventional products had higher levels of potassium, phosphorus, and total protein, all basic constituents of conventional fertilizers. Nutrition scientist Denis Lairon reported similar findings in a review published online 8 July 2009 ahead of print in *Agronomy for Sustainable Development*.

Charles Benbrook, The Organic Center's chief scientist and coauthor of the *New Evidence* report, criticizes the U.K. review for not requiring the individual studies to have used the same cultivars on organic and conventional plots. Differences in plant varieties—for instance, between hybrid and heirloom varieties of tomatoes—can result in dramatic differences in nutrient content, he says. “We went with what was available,” responds Dangour. “In general I recall most studies compared the same cultivars.”

Another criticism: the study did not require organic fields to have been used as such for a minimum number of years. “We know from a large body of research that the biological benefits of organic farming mostly come from improvements in soil quality,” says Benbrook. Moreover, long-term studies of organic and conventional tomatoes by food chemist Alyson Mitchell at the University of California, Davis, have demonstrated that soil organic matter takes at least five years to reach optimal levels. And national standards defining organic production practices were not established until 2002.

Mitchell cautions against drawing sweeping conclusions from comparison studies of organic versus conventional. She notes that organic practices vary immensely, with some modern industrial-scale organic farms using methods more similar to those of conventional farms, such as growing just a single crop (monoculture).

But Benbrook says sustainably conducted organic farming offers benefits beyond nutrition, including improved health of pollinators and cleaner waterways resulting from minimal pesticide use, significant carbon sequestration as soil builds up through organic cultivation, and potential shrinkage of oceanic dead zones due to reduced nitrogen fertilizer pollution. Melissa Perry, an associate professor of occupational epidemiology at the Harvard School of Public Health, also says children on organic diets have shown significantly lower levels of pesticide metabolites in their urine than children on conventional diets. As to the dangers thereof, Perry says the risk assessments conducted so far by the Environmental Protection Agency are limited because they do not routinely account for cumulative and potentially synergistic effects of multiple pesticides.

David C. Holzman writes from Lexington and Wellfleet, Massachusetts, on science, medicine, energy, economics, and cars. He has written for *EHP* since 1996.

emit EMF levels more than 8 times the WHO-recommended maximum of 3 milligauss. Under the settlement, Public Service Electric & Gas Co. agreed to pay \$95,000 to relocate playgrounds located under its lines. There is limited evidence that EMFs from power lines may be a risk factor for childhood leukemia.

Colorimetric “Nose” Alerts Chemical Handlers

In a report published online 13 September 2009 in *Nature Chemistry*, Kenneth Suslick and colleagues present a postage stamp-sized electronic sensor capable of quickly and inexpensively detecting toxic chemicals and their concentrations through color visualization. The pattern created by color changes in the disposable 36-dye sensor array identifies both the toxicant and its concentration. The sensor can detect more chemicals than previous methods and produces most results within 2 minutes. The researchers have developed a handheld version similar to a card-scanning device that uses LED illumination and an ordinary camera.

Take-Home Dust Boosts Car Seat Lead Levels

Several studies have established that lead-exposed workers can carry lead-contaminated dust off the jobsite on their clothing, shoes, and tools. In the 21 August 2009 *MMWR* Tina Bernier et al. report the first known cases of childhood lead poisoning attributed to take-home lead dust deposited onto car safety seats. No contamination was found in the six children's homes, leading the researchers to examine family vehicles and car seats, where high lead levels were found. Although previous studies have recommended monitoring blood lead levels among children of lead-exposed workers, no standards exist for levels of lead dust contamination in vehicles or on child car safety seats.

Indoor Greenery Releases VOCs

Peace lilies, snake plants, weeping figs (ficus trees), and areca palms are just a few of the houseplants that have been shown to remove volatile organic compounds (VOCs) from indoor air, but a new study by Dong Sik Yang et al. in

the August 2009 issue of *HortScience* finds they can also release these chemicals. The authors found these four types of houseplants released 12–23 VOCs, and although the researchers did not quantify potential exposures, they did note that emissions were higher during the day than at night. The authors attributed the VOCs to pesticides used in nurseries, microorganisms living in the growing medium, and offgassing of plastic planters.

